



## HARMONISING ECONOMIC ADVANCEMENT WITH ENVIRONMENTAL SUSTAINABILITY IN INDIA WITH GREEN ENERGY

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### Abstract

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*India has achieved considerable economic growth since the liberalisation of its economy in the 1990s. This swift economic advancement has resulted in environmental deterioration, resource exhaustion, and increased greenhouse gas emissions. The notion of green growth has arisen as an essential technique to tackle the difficulty of dissociating economic expansion from environmental degradation. This report analyses India's green growth policies, plans, and accomplishments, assessing the nation's endeavours to reconcile economic progress with environmental sustainability. This report assesses progress, identifies problems, and proposes solutions for attaining sustainable growth through an examination of pertinent policies, programs, and initiatives.*

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**Keywords:** *Green energy, renewable energy, economic development*

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### 1. Introduction

India is among the world's rapidly expanding economies, with an annual growth rate of roughly 7-8% till 2020. This growth has resulted in enhanced living standards; but, its environmental repercussions, especially regarding air pollution, water scarcity, deforestation, and greenhouse gas emissions, have been considerable. Reconciling economic development with environmental sustainability has emerged as a critical policy concern for the nation. India secured the fourth position globally for installed renewable energy capacity, propelled by governmental initiatives and private sector investments. The country has established aspirational objectives for increasing green energy generation, along with its dedication to the Paris Agreement and attaining net-zero carbon emissions by 2070. Renewable energy sources, including solar, wind, hydro, and biomass, are essential for environmental sustainability and for attaining socio-economic objectives such as poverty alleviation, rural electrification, and employment generation.

### Problem Statement

How has India reconciled its goal of economic expansion with the necessity of environmental sustainability and what were the results of its green growth strategies?

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Research Question: What were the principal policies, tactics, and obstacles encountered by India in the implementation of green growth from 2000 to 2020, and what insights may be derived from these experiences to inform future initiatives?

### **Objectives**

The followings are the main objectives of this paper:

- To assess India's green growth policies and efforts enacted.
- To evaluate the achievements and obstacles of green growth in India, concentrating on renewable energy, energy efficiency, sustainable agriculture, and waste management.
- To examine the economic and environmental effects of green growth methods in India.
- To propose policy proposals to enhance green growth in India moving forward.

### **Review of Literature**

The discourse on green growth in India emphasises the comprehension of economic-environmental trade-offs and the prospects for sustainable development. As the global population rises daily, energy consumption is escalating rapidly. The utilisation of renewable energy resources appears to be a significant initiative by which surplus energy can be produced, as energy generation has become a critical issue globally (National Academy of Sciences, National Academy of Engineering, and National Research Council). The paramount factor in enhancing renewable energy sources is to demonstrate a series of favourable outcomes, such as mitigating the greenhouse effect and addressing climate change (Panwar, N. *et al*). Utilising renewable energy sources for power generation is imperative, as reliance solely on conventional energy sources is insufficient to satisfy our demands. Solar energy is a crucial renewable energy source utilised globally.

Green growth denotes the promotion of economic expansion while mitigating environmental damage by innovation, resource efficiency, and sustainable methodologies. This is especially pertinent for growing economies such as India, where swift expansion and environmental issues are intricately linked.

### **Decoupling expansion from Environmental Impact**

Decoupling denotes the attainment of economic expansion without concomitant escalations in environmental degradation. India's green growth strategy is centred on renewable energy, sustainable agriculture, and the optimal utilisation of natural resources.

## Challenges

Despite advancements, India has faced pervasive pollution, deforestation, and resource overexploitation. Attaining green growth necessitates surmounting infrastructural, financial, and technical obstacles.

## Methodology

The study utilises a qualitative analysis of secondary data obtained from governmental reports, international energy agencies, and scholarly sources. Moreover, quantitative data about renewable energy capability, employment generation, and environmental indicators are examined.

## Initiatives for Green Growth in India

Indian economy is one of the fastest growing economies across the globe. It requires to push green energy sector for the sustainable and comprehensive growth. The Government have been taking initiatives for the creation and expansion of the green energy.

### A. National Action Plan on Climate Change (NAPCC)

Initiated in 2008, the NAPCC established the framework for India's strategy for climate change and sustainable development. It delineated eight national missions to tackle diverse aspects of climate change and foster green growth, including:

#### - National Solar Mission

India established high objectives for solar energy, targeting 20 GW of solar electricity by 2022, which was subsequently raised to 100 GW by 2022 under the Pradhan Mantri Ujjwala Yojana.

#### - The Energy Efficiency Mission

It encompasses the Perform, Achieve, and Trade (PAT) scheme and the Standards & Labelling program, both designed to enhance energy efficiency in industrial and building sectors.

#### - National Mission for Sustainable Agriculture (NMSA)

Advocating for sustainable agricultural methodologies, optimal water utilisation, and organic farming techniques.

#### - National Water Mission

Emphasises water conservation and enhances the efficiency of water utilisation in agriculture, industry, and urban settings.

## **Expansion of Renewable Energy**

India has achieved substantial advancements in renewable energy development, especially in solar and wind power. By 2020, India emerged as a prominent nation in renewable energy capability. By 2020, India has installed 36.6 GW of solar energy capacity, establishing itself as one of the major solar markets globally. India emerged as a leader in wind energy, achieving an installed capacity of 38.5 GW by 2020.

## **Constraints**

Despite significant growth in renewable energy capacity, obstacles included insufficient grid infrastructure, funding constraints, and technical impediments such as energy storage.

## **Sustainable Agriculture and Land Utilisation**

India has implemented various green growth initiatives in the agricultural sector to improve sustainability and mitigate environmental degradation:

- **Organic Farming**

Sikkim has pioneered organic farming, being designated the first entirely organic state in 2016.

- **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)**

Designed to enhance water-use efficiency in agriculture by the building of irrigation infrastructure.

- **Challenges**

Notwithstanding these measures, India's agriculture continues to rely heavily on chemical fertilisers and irrigation, both of which are water-intensive and exacerbate environmental stress.

## **Energy Efficiency Initiatives**

The Bureau of Energy Efficiency (BEE) directed India's energy efficiency initiatives in accordance with the Energy Conservation Act of 2001. Initiatives such as the Perform, Achieve, and Trade (PAT) initiative, which focusses on energy-intensive industries, and the Standards & Labelling Program for appliances, are designed to diminish energy consumption across many sectors. The execution of these programs resulted in enhancements in energy efficiency; however, the rate of acceptance varied among industries and locations.

### - **Challenges**

A significant problem was the insufficient awareness and financial incentives for energy saving initiatives in small and medium-sized firms.

### **Waste Management and Circular Economy**

India has launched multiple initiatives to regulate trash and shift towards a circular economy framework. Launched in 2016, the Swachh Bharat Mission sought to enhance sanitation and waste management in both urban and rural regions.

### **Circular Economy**

Numerous states implemented recycling initiatives and waste-to-energy facilities to address waste management and minimise landfill utilisation.

### - **Challenges**

Efficient waste management continues to pose difficulties in urban environments, as numerous cities are deficient in proper trash segregation, recycling infrastructure, and public awareness initiatives.

### **Obstacles and Hindrances to Sustainable Development in India**

India is a diversified economy comprising of a vast differences in terms of religion, languages, income and wealth inequalities, lack of efficient infrastructure etc. It is a giant challenge for India to become sustainable in terms of green energy. The followings are the barriers to sustainable development in India.

### - **Infrastructure Limitations**

India encounters considerable obstacles in enhancing infrastructure to facilitate renewable energy and energy-efficient technology, especially in rural and isolated regions.

### - **Financial Barriers**

Despite governmental incentives, money continues to provide a substantial obstacle to the extensive implementation of green technology, especially within the renewable energy and energy efficiency domains.

### - **Institutional and Policy Deficiencies**

Inconsistent policy frameworks, inadequate enforcement of environmental legislation, and insufficient cooperation between federal and state governments have hindered the efficient execution of green growth initiatives.

### - Social and Political Challenges

Public opposition to alterations, such as transitioning to renewable energy or modifying agricultural practices, has impeded progress in certain domains.

### Recommendations for Policy

Enhancing Policy Coordination: Improved collaboration between central and state governments is crucial for the successful execution of green growth projects, especially in renewable energy and sustainable agriculture.

The government could enhance financial support by offering additional incentives and low-interest loans to small and medium firms for the adoption of green technologies and the enhancement of energy efficiency. Public education initiatives can elevate knowledge of green growth and promote the adoption of sustainable practices in urban and rural settings. The government ought to allocate resources towards enhancing energy grids, renewable energy storage systems, and waste management infrastructures to facilitate sustainable development.

### Conclusion

India's green growth programs have achieved significant progress in reconciling economic development with environmental sustainability. Despite notable advancements in renewable energy, energy efficiency, and sustainable agriculture, India encounters numerous obstacles that impede the complete attainment of green growth. By rectifying infrastructure deficiencies, enhancing policy frameworks, and augmenting financial and technical assistance, India can persist in its trajectory towards sustainable growth in the forthcoming years.

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